AF

TRANSMITTAL OF SUBSTITUTE APPEAL BRIEF	Docket No.

In re Application of: Jesse C. Shan

Application No.	Filing Date	Examiner	Group Art Unit
10/025,002 – Conf. #3660	December 19, 2001	J.M. Hoffman	1731

Invention: TRIANGLE-SHAPED PLANAR OPTICAL WAVEGUIDE HAVING REDUCED SCATTERING LOSS

TO THE COMMISSIONER OF PATENTS:

Transmitted herewith is the Substitute Appeal Brief in this application, with respect to the Notification of Non-Compliant Appeal Brief. No fee is necessary filed: March 11, 2005

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Dated: March 11, 2005

Chun M. Ng
Attorney Reg. No. : 36,878
4003 47th Ave. S.
Seattle, WA 98118
(206) 359-6488

(PATENT)

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Patent Application of:
Jesse C. Shan

Application No.: 10/025,002 | Confirmation No.: 3660

Filed: December 19, 2001 | Art Unit: 1731

For: TRIANGLE-SHAPED PLANAR OPTICAL WAVEGUIDE HAVING REDUCED SCATTERING LOSS | Examiner: Hoffman

SUBSTITUTE APPEAL BRIEF

MS Appeal Brief - Patents
Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Sir:

This is a Substitute Appeal Brief submitted in response to the Examiner's Notification of Non-Compliant Appeal Brief. This paper has been modified to correct the claim error noted by the Examiner. This paper has also been modified to add specific references to the specification. Other typographical errors have been correct. Other changes have been made to comply with the Examiner's suggestions.

As required under § 41.37(a), this brief is in furtherance of the Notice of Appeal in this case filed on November 23, 2004, and it is filed within two months of this date. The fees required under § 41.20(b)(2) are dealt with in the accompanying TRANSMITTAL OF APPEAL BRIEF.

This brief contains items under the following headings as required by 37 C.F.R. § 41.37 and M.P.E.P. § 1206:

I. REAL PARTY IN INTEREST

The real party in interest for this appeal is:

Jesse C. Shan

II. RELATED APPEALS, INTERFERENCES, AND JUDICIAL PROCEEDINGS

There are no other appeals, interferences, or judicial proceedings which will directly affect, be directly affected by, or have a bearing on the Board's decision in this appeal.

III. STATUS OF CLAIMS

A. Total Number of Claims in Application

There are 13 claims pending in this application.

B. Current Status of Claims:

1. Claims canceled: 3, 7, 14-15, and 17-19

2. Claims withdrawn from consideration but not canceled: none

3. Claims pending: 1, 2, 4-6, 8-13, 16 and 20

4. Claims allowed: none

5. Claims rejected: 1, 2, 4-6, 8-13, 16 and 20

C. Claims On Appeal

The claims on appeal are claims 1, 2, 4-6, 8-9, 11-13 and 16.

IV. STATUS OF AMENDMENTS

All amendments to the claims have been entered. Accordingly, the claims enclosed herein in Appendix A reflect the current state of the claims.

V. SUMMARY OF INVENTION

The present invention is directed towards optical waveguides formed on an integrated circuit using a high-density plasma chemical vapor deposition (HDPCVD) process. Specification at page 1, lines 5-7. The problem solved by the present invention is the reduction of signal loss (such as by scattering) by means of using a triangularly shaped optical waveguide. Specification at page 10, lines 9-10. In the prior art, optical waveguides formed on an integrated circuit are rectangular in cross section. Specification at page 3, lines 5-8. This is an artifact of using conventional integrated circuit manufacturing processes.[1] Specification at page 2. As detailed in the Background section of the present specification, U.S. Patent No. 5,119,460 to Bruce shows a prior art optical waveguide (30 and 40) that is rectangular in cross-section. Specification at page 2.

[1] The Board may appreciate that non-integrated circuit optical waveguides are generally circular or elliptical in shape.

In contrast to the prior art as exemplified by Bruce, the present invention teaches that through the use of HDPCVD processes[2], a triangularly shaped waveguide may be formed. Specification at pages 8-9. Specifically, in Figure 1, a substrate material 101 is used as a base material. See Figure 1. A lower cladding layer 103 is then formed on the substrate material 101. Specification at page 5, lines 20-21. Alternatively, the lower cladding layer 103 may also be formed from the same material as the substrate material 101. Specification at page 6, lines 11-12.

Next, as seen in Figure 2, the lower cladding layer 103 is patterned and etched to waveguide supports 201 that have a width (A) and a height (B). Specification at page 6, lines 17-20. In general, the height B is greater than the width A. Specification at page 6, lines 20-22. Once the waveguide supports 201 have been formed, the core material that forms the optical waveguide is deposited using a HDPCVD process. Specification at page 7, lines 2-5. Because of the particular characteristics of the HDPCVD process and the relationship of height B to width A, the optical waveguide 301 formed is triangularly (or "bullet") shaped. Specification at page 6, lines 20-22. Finally, in Figure 4, an upper cladding material 401 is deposited to encapsulate the optical waveguide 301. See Figure 4 and specification at page 10, lines 1-3.

[2] HDPCVD is a common semiconductor process that is used frequently to deposit oxide material, though typically only for insulative purposes.

VI. GROUNDS OF REJECTION PRESENTED FOR REVIEW

A. Claims 1-2, 4-6, 8-13, 16 and 20 stand rejected under Section 112 as failing to comply with the written description requirement.

B. Claims 1-2, 4-6, 8-13, 16 and 20 stand rejected under Section 112 as being vague and indefinite.

C. Claims 1-2, 5, and 8-9 stand rejected under Section 102 over U.S. Patent No. 5,119,460 issued to Bruce ("Bruce").

D. Claim 10 stands rejected under Section 102 and/or Section 103 over Bruce.

E. Claims 1, 4, 6, 11-13, 16 and 20 stand rejected under Section 103 as being unpatentable over Bruce in combination with U.S. Patent No. 6,154,582 to Bazylenko.

VII. ARGUMENT

Applicant respectfully submits the following arguments in response to the Examiner's final rejection:

A. Section 112 – Written Description Requirement

The Examiner argues that with respect to Claim 10, there is no support that the width of the waveguide support 201 is less than the height of the waveguide support 201. The Board's attention is directed to the Specification at page 6, lines 18-22, which details that the height of the waveguide support 201 may be less than the width in order to facilitate a triangular-shaped optical waveguide.

The Examiner also argues that there is no support for the waveguide support "being raised" relative to the lower cladding layer. The Board's attention is directed to Figure 2, which shows the lower cladding layer **after etching**. As detailed on page 6, lines 16-18, the waveguide supports 201 are formed after etching of the lower cladding layer 103. The waveguide supports 201 are thus "pillars" that are raised above the lowest level of the lower cladding layer. Another way to view the

process is that the lower cladding layer is "lowered" in certain sections by etching in order to leave the waveguide supports 201. Applicant submits that one of ordinary skill in the art, after reviewing the specification as a whole, would understand how the waveguide supports 201 are raised relative to the lower cladding layer 103.

B. Section 112 – Vagueness and Indefiniteness

The Examiner argues that in Claim 10 there is no antecedent basis for the term "said waveguide height dimension". Applicant agrees with the Examiner on this point and will yield on Claim 10 as to allowability at this juncture. However, applicant reserves the right to pursue Claim 10 in a continuation or divisional case following the conclusion of this appeal.

The Examiner argues that the term "non-rectangular" in Claim 20 is unclear. Applicant agrees with the Examiner on this point[3] and will yield on Claim 20 as to allowability at this juncture. However, applicant reserves the right to pursue Claim 20 in a continuation or divisional case following the conclusion of this appeal.

The Examiner argues that the term "being raised" in Claims 1 and 11 are unclear. As noted above, the Board's attention is directed to Figure 2, which shows the lower cladding layer **after etching**. As detailed on page 6, lines 16-18, the waveguide supports 201 are formed after etching of the lower cladding layer 103. The waveguide supports 201 are thus "pillars" that are raised above the lowest level of the lower cladding layer. Another way to view the process is that the lower cladding layer is "lowered" in certain sections by etching in order to leave the waveguide supports 201. Applicant submits that one of ordinary skill in the art, after reviewing the specification as a

[3] Applicant intended that the term "non-rectangular" applies to the cross-section of the optical waveguide.

whole, would understand how the waveguide supports 201 are raised relative to the lower cladding layer 103.

C. Section 102 – Anticipation by Bruce

The Examiner also rejects Claims 1-2, 5 and 8-9 as being anticipated by Bruce. The Bruce patent is nothing more than a prior art method of forming an optical waveguide on a planer lower cladding layer. As seen in Figure 1, the lower cladding layer 20 is substantially planar. Unlike Claims 1 and 11 as amended, the lower cladding layer 20 of the Bruce patent does not disclose a waveguide support structure that is raised above the level of the lower cladding layer such that the support has a width and height dimension. Further, Claims 1 and 11 require that the waveguide support is formed from the lower cladding layer. In contrast, accepting for argument purposes that structure 30 can be considered a waveguide support, the structure 30 is **not** formed from the same material as the lower cladding material 20. Thus, the language of Claims 1 and 11 is still patentable over the Bruce patent.

With respect to Claim 4, there is no indication in Bruce that a HDPCVD process is used to form the optical waveguide. The Examiner has failed to point this teaching out in the Bruce patent.

With respect to Claim 9, the Examiner points to Figure 1 and argues that this shows the *in situ* formation of multiple layers onto a substrate. The term *in situ* as used in the semiconductor processing arts refers to the ability to perform multiple steps or tasks without the need to remove the semiconductor wafer from a process chamber. This is advantageous from a manufacturing efficiency and yield standpoint.

As noted on pages 11-12 of the present specification, because there is no etching of the core material after deposition, the upper cladding layer can be deposited *in situ* (in the same process

chamber) as the core material, thereby adding to the manufacturing efficiency of the present invention. In contrast, the cited prior art makes no mention of *in situ* formation of the core material and the upper cladding layer. The Examiner appears to indicate that the term *in situ* means "on top of the substrate". Applicant does not intend that meaning of the term *in situ*, and believes that that meaning is not a conventional use of the term. In any event, the term *in situ* as used in the claims is intended to mean the commonly understood definition of "within the same chamber" as used in the art. Using this definition, Claims 9 and 16 are believed to be allowable.

Further, when an HDPCVD process is used, as required by Claims 4, 11-13 and 16, as detailed in my U.S. Patent No. 6,251,795, a "sputter-and-deposition HDPCVD process" produces a non-rectangular (specifically triangular or bullet shaped or tapered) waveguide. By ceasing the sputtering component of the HDPCVD process, and allowing only the deposition component of the HDPCVD process to proceed, the top cladding layer can be formed *in situ*. Once again, the combination of HDPCVD and *in situ* process as claimed provides significant advantages over the prior art.

D. Section 102 – Claim 10

As noted above, applicant is conceding with respect to Claim 10 on other grounds. Thus, Claim 10 will be taken up following conclusion of this proceeding.

E. Section 103 – Bruce Combined with Bazylenko

Claims 1, 4, 6, 11-13 and 16 stand rejected as being an obvious combination of Bruce and Bazylenko. Bazylenko is cited for the proposition of teaching a HDPCVD process. However, the Examiner is mistaken. The Examiner appears to confuse a low pressure chemical vapor deposition process (LPCVD) with a **"high density plasma"** chemical vapor deposition. In the LPCVD

process, the pressure of the reaction chamber is lowered to suppress spontaneous reactions. See Col. 3, lines 1-3 of Bazylenko. In a HDPCVD process, a plasma is used to ionize the reactant products., which are then accelerated towards the wafer surface to deposit films with high aspect-ratio characteristics, i.e., the new layers are preferentially formed on horizontal surfaces. Thus, LPCVD and HDPCVD are two different processes that are very dissimilar.

With respect to the Bazylenko patent, much of the same arguments made above apply equally. Specifically, the Bazylenko patent does not teach the use of an *in situ* manufacturing process for the core layer and the upper cladding layer. Bazylenko does not teach a waveguide support that has a width that is less than its height. Assuming for the sake of argument that Bazylenko teaches a waveguide support, it is clear from Figures 6A-6H of Bazylenko that the width of the "support" is much **greater than** the height of the support. Thus, Claim 11 is in condition for allowance.

VIII. CLAIMS INVOLVED IN THE APPEAL

A copy of the claims involved in the present appeal is attached hereto as Appendix A.

IX. EVIDENCE

No evidence pursuant to §§ 1.130, 1.131, or 1.132 or entered by or relied upon by the examiner is being submitted.

X. RELATED PROCEEDINGS

No related proceedings are referenced in II. above, or copies of decisions in related proceedings are not provided, hence no Appendix is included.

Dated: March 11, 2005

Respectfully submitted,

By_____
Chun M. Ng
Registration No.: 36,878

4003 47th Ave. S.
Seattle, Washington 98118
(206) 359-6488
(206) 359-7488 (Fax)
Attorney for Applicant

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I hereby certify that this correspondence is being deposited with the United States Postal Service with sufficient postage as first class mail in an envelope addressed to: Commissioner for Patents, P.O. Box 1450, Alexandria, Virginia 22313-1450 on March 11, 2005.

Signature: _____
Chun M. Ng

APPENDIX A

Claims Involved in the Appeal of Application Serial No. 10/025,002

Following is a complete listing of the claims pending in the application, as amended:

1. (Previously presented) A method comprising:

forming a lower cladding layer, said lower cladding layer having at least one waveguide support, said at least one waveguide support being raised relative to said lower cladding layer such that said at least one waveguide support has a waveguide support width dimension and a waveguide support height dimension;

forming a core material onto said at least one waveguide support; and

forming an upper cladding layer over said core material.

2. (Original) The method of Claim 1 wherein said upper cladding layer and said lower cladding layer surround said core material.

3. (Cancelled)

4. (Previously presented) The method of Claim 1 wherein said forming of said core material is by using a high density plasma chemical vapor deposition (HDPCVD) process.

5. (Original) The method of Claim 1 wherein said core material is an oxide.

6. (Previously presented) The method of Claim 1 wherein the step of forming said lower cladding layer comprises:

blanket depositing lower cladding material onto a substrate; and

patterning and etching said lower cladding material to form said waveguide support.

7. (Cancelled)

8. (Original) The method of Claim 1 wherein said core material is doped with a rare earth element.

9. (Previously presented) The method of Claim 1 wherein the steps of forming said core material and forming said upper cladding layer are *in situ* with each other.

10. (Previously presented) The method of Claim 1 wherein said waveguide support width dimension is less than said waveguide height dimension.

11. (Previously presented) A method comprising:

forming a lower cladding layer, said lower cladding layer having at least one waveguide support, said at least one waveguide support being raised relative to said lower cladding layer such that said at least one waveguide support has a waveguide support width dimension and a waveguide

support height dimension, said waveguide support width dimension less than said waveguide support height dimension;

forming a core material onto said at least one waveguide support using a high density plasma chemical vapor deposition (HDPCVD) process, wherein said core material is an oxide; and

forming an upper cladding layer over said core material, wherein said upper cladding layer and said lower cladding layer surround said core material.

12. (Previously presented) The method of Claim 11 wherein the step of forming said lower cladding layer comprises:

blanket depositing lower cladding material onto a substrate; and

patterning and etching said lower cladding material to form said waveguide support.

13. (Previously presented) The method of Claim 11 wherein the step of forming said core material is performed such that said core material is doped with a rare earth element.

14. (Cancelled)

15. (Cancelled)

16. (Previously presented) The method of Claim 11 wherein the steps of forming said core material and forming said upper cladding layer are *in situ* with each other.

17. (Cancelled)

18. (Cancelled)

19. (Cancelled)

20. (Previously presented) The method of Claim 11 wherein said core material is non-rectangular.